Congress of the United States
Washington, DC 20515

January 7, 2005

STEM CELL RESEARCH IS COMPLEX
"A VIEW FROM THE LAB" BREAKS IT DOWN

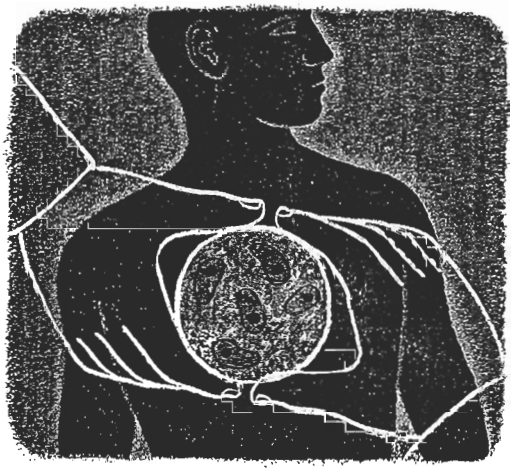
Dear Colleague:

We wanted to share with you the following article from the December 6, 2004 issue of *Newsweek*, which we believe succinctly explains embryonic stem cell research.

View From the Lab
INSIGHTS FROM HARVARD MEDICAL SCHOOL

Harnessing Stem Cells

BY ANTHONY L. KOMAROFF, M.D., AND GEORGE Q. DALEY, M.D., PH.D.



How does a child with type 1 diabetes resemble a 60-year-old heart-attack victim or an 80-year-old Parkinson's patient? Outwardly their conditions have little in common, yet they share a critical feature. All three involve the loss of a single type of specialized cell that the body can't replace on its own. Cell depletion is the root cause of many major diseases, from Alzheimer's to heart failure. And though treatment can often ease the symptoms, it rarely solves the underlying problem. That's why researchers are so keen on the potential of stem cells. Cultivated and administered in the right ways, these all-purpose precursors could conceivably replenish any tissue an ailing patient lacked. The challenge—and it's not a small one—is to learn to direct their development.

Every cell in the body houses the same collection of about 25,000 genes, but different genes are active in different types of cells. Gene activity is what distinguishes a heart cell from a brain cell or a kidney cell. The stem cells in a 5-day-old embryo can develop into any of these specialized cell types, but this "pluripotent" state doesn't last long. As a stem cell picks up chemical signals from its surroundings, different genes get switched on or silenced, and the cell becomes more specialized. Specialized cells can no longer switch roles as needed, and few can reproduce. That's why heart attacks and brain injuries are so devastating. They leave the injured organ powerless to repair itself.

Stem-cell therapy could change that, but researchers still face several hurdles. The first is to learn more about how cells develop and specialize. Suppose you wanted to turn a stem cell into a neuron that could manufacture dopamine, the brain chemical that Parkinson's patients lack. Which of the cell's 25,000 genes would you activate? Which ones would you silence? And how would you orchestrate all this activity? The task may sound overwhelming, but the science is evolving rapidly. Researchers have already used stem cells to treat Parkinson's, diabetes and spinal-cord injuries in mice, and few experts doubt that stem-cell therapy will one day be feasible in people.

Unfortunately, feasible doesn't always mean practical. Right now, human embryos are the only reliable source of high-quality pluripotent stem cells. Researchers harvest them from embryos that fertility clinics would otherwise discard, but that practice is controversial and the supply is finite, so experts are eager to find new sources of stem cells. The partially specialized stem cells found in bone marrow and some other adult tissues are useful for certain tasks, such as replenishing blood cells destroyed by chemotherapy. Unfortunately, they aren't nearly as versatile as embryonic cells.

A technique known as nuclear transfer, or "therapeutic cloning," may someday provide you with your own personal supply of embryonic stem cells. Doctors would extract an egg from a woman's ovaries, then remove the nucleus and replace it with the nucleus from one of your cells. The egg, which now contains your genes, would divide and, after several days, develop into a 200-cell blastocyst. Cells from the blastocyst would be extracted and left to multiply in a laboratory dish. These cloned cells could be used to repair your tissues. And unlike stem cells plucked from fertility clinics, they would never be rejected by your immune system.

None of these techniques will revolutionize medicine this year or next, but the pace of discovery is accelerating. In South Korea, researchers have started to conduct human experiments with nuclear transfer. The ethics debates are sure to continue, and they should. Because stem-cell therapy is no longer an idle fantasy—it's a revolution waiting to happen.

KOMAROFF is editor in chief of Harvard Health Publications; DALEY conducts stem-cell research at Harvard Medical School and the Children's Hospital Medical Center. For more information, go to health.harvard.edu/newsweek.

We will continue to work to ensure that the full potential of stem cell research is explored. For more information or to become an original cosponsor of the "Stem Cell Research Enhancement Act," please contact Elizabeth Wenk with Rep. Castle (5-4165) or Meghan Taira with Rep. DeGette (5-4431).

Sincerely,

Mike Castle

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